

Canadians, however, amount to \$4.5 million for cancer alone.

Of the 40 major departments and agencies in the Canadian government which received 1974-75 budget increments, the MRC was the 38th from the top with a 2.7% increase; Health Minister Lalonde later added another \$1 million putting the MRC 35th from the top. (The top six included the Department of National Health and Welfare with 38% more, the Correctional Services Department with 28%, the CBC with 25%, the St. Lawrence Seaway with 25%, Central Mortgage and Housing Corporation with 22%, and Statistics Canada with 22%).

An editorial in the *Ottawa Journal* (Apr. 20, 1974) put it very well:

The amount of federal spending devoted to medical research is a matter of government priorities, Health Minister Marc Lalonde has said. A perfectly unexceptionable statement. One expects that the government would have its priorities. What is utterly unexpected is that medical research should be given low priority. What is indefensible is that a government which has allowed federal spending to rise at a frightening and dangerous rate has chosen medical research, of all things, as an area for imposing tight controls... The restraints are... ultimately, self-defeating. Canada has an obligation to do its share of the medical research... being done in the world.

Canada has always been very sensitive and responsive to its international obligations, as indicated by Canada's current \$100 million fund to ease inflation in Asia and Africa, and its 17% increase (to \$565 million per year) for the Canadian International Development Agency.

MP: *Perhaps we have had enough funds spent on basic research and the government should now allocate basic research dollars to health care projects.*

MD: Basic medical research in the lab helped conquer polio. If we had been health delivery-oriented only, we would have merely built a better iron lung and polio would still be with us today. The basic research of Dr. R. C. Parker and associates at the Connaught Labs in Toronto developed medium 199 which revolutionized the field of tissue culture and virology, and made possible the mass production of Salk polio vaccine.

Kidney-diseased patients on chronic blood dialysis can now take small portable artificial kidney machines on vacation or abroad, using a recirculating dialysate system and a disposable purification cartridge; the cartridge is based on fundamental, curiosity-oriented research by Dr. T. M. S. Chang of the McGill University physiology department.

Even the insulin discovery of Banting and Best had to be preceded by Claude Bernard's work on sugar in the liver in the 1850s and also by Minkowski's and von Mering's 1889 discovery that removal of the pancreas produced fatal diabetes in dogs.

It is thus an irresponsible illusion that health care is independent of medical research.

MP: *If better health care depends so much on medical research, is there some clear guideline which indicates how much of the health care dollar should be allotted to medical research?*

MD: The research budget of viable industries is generally 3-5% of the overall expenditure. The data in Fig.

3 indicate that the MRC budget is 0.85% of that for the Department of National Health and Welfare and that this proportion has been falling steadily since 1970-71. The proportion in the United States is between 2% and 3%.

MP: *Would it not be better for Canadian medical researchers to focus their work and funds on certain important diseases rather than spread the time and money on non-relevant projects?*

MD: The public and the newspapers are constantly demanding that more research be done on all kinds of important health problems. One year the demand is for research on mercury pollution or marijuana effects on the unborn child, while the following year it may be for acupuncture anesthesia or safer drugs. Since it takes time to train researchers and to develop good programs, it is not feasible to turn these programs on and off like a faucet. It is essential to move continuously ahead in many areas of biomedical research in Canada, since it is impossible to predict what public priorities will next arise and impossible to predict where the next fundamental step of discovery will appear. Such a broad research front will promote important advances in medical teaching, medical treatment and disease prevention. The total equation for health care involves all of these four factors; if one of these is neglected all four suffer.

Practically all the important advances I have mentioned in this discussion started out as so-called non-relevant research. Perhaps the most remarkable example of mission-oriented medical research going on today is that of the National Cancer Authority in the

continued on page 730

M. Donald Phillipson a très bien résumé l'état de la recherche biomédicale au Canada dans deux articles très récents publiés dans cette même revue. Il y présente les données essentielles à la fois du point de vue législatif et budgétaire.

Il est évident que tous les membres de la profession sont convaincus de la nécessité de la recherche biomédicale, mais il faut que tous soient sensibilisés et souscrivent aux principes de base qui prouvent que cette recherche est une nécessité absolue et non un luxe toléré; le but de cet article est de rationaliser les principes qui doivent gouverner à l'élaboration d'une politique scientifique cohérente et éclairée.

La nécessité de la recherche médicale est tellement évidente qu'il devient in-

La recherche médicale: une nécessité absolue et non un luxe toléré

DR. MICHEL CHRÉTIEN

tellement difficile d'accepter de se battre pour en démontrer l'importance. N'importe quel malade qui est soulagé par une thérapie qui a été l'œuvre d'années d'effort le comprend. N'importe quel parent ou ami qui en est témoin est aussi d'accord. Ceci n'est cependant qu'un argument dit "sentimental" auquel on oppose souvent des

Le docteur Chrétien est directeur du laboratoire des protéines et des hormones hypophysaires à l'Institut de Recherches cliniques de Montréal.

questions d'ordre économique ou politique comme (a) "Prouvez que la recherche biomédicale est économiquement rentable", (b) "Prouvez que c'est une activité essentielle à toute communauté", et (c) "Prouvez que le public la considère comme une priorité".

J'ai utilisé au tout début l'argument sentimental des malades guéris pour démontrer qu'en multipliant ces exemples par milliers, le public vient à former un groupe de pression dont la faveur pour la recherche médicale ne se transpose pas en démonstrations bruyantes, en communiqués frappants ou en mémoires élaborés. Elle se manifeste par contre d'une façon tangible durant les campagnes de souscription des organismes privés comme la Société Canadienne du Cancer et la Société

DBI-TD^{*} (phenformin HCl)

INDICATIONS: Stable adult diabetes that does not respond to diet alone, particularly the overweight, ketoacidosis-resistant diabetic in whom phenformin may aid in the reduction of body weight. In general, this applies to persons over 40 and requiring 40 insulin units or less daily.

Stable adult diabetics who are primary or secondary failures with sulfonylureas. These patients may be treated with phenformin alone or in combination with a sulfonylurea.

Phenformin may aid as adjunctive therapy in some cases of insulin-dependent diabetes where insulin dosage is very high or when the patient is poorly controlled with insulin alone.

Note: Phenformin is not required in diabetes mellitus that can be controlled by diet alone nor in juvenile diabetes mellitus that is well regulated on insulin.

ADVERSE REACTIONS: Principal side effects are related to the gastrointestinal tract, of which a warning signal is an unpleasant metallic taste. Anorexia, nausea, and less frequently, vomiting and diarrhea are seen. At the first sign of gastrointestinal upset the dose of DBI should be reduced, and in case of vomiting, should be immediately withdrawn.

PRECAUTIONS: Starvation Ketosis: This must be differentiated from "Insulin Lack" ketosis and is characterized by ketonuria in spite of relatively normal blood sugar with little or no urinary sugar. Starvation ketosis may result from excessive DBI therapy, excessive insulin reduction or insufficient carbohydrate intake. Appropriate measures to supply carbohydrates or adjust insulin or lower DBI dosage alleviate this state.

DO NOT GIVE INSULIN WITHOUT FIRST CHECKING BLOOD AND URINE SUGAR DETERMINATIONS.

Lactic Acidosis: Questions have arisen regarding the possible contribution of DBI to the appearance of lactic acidosis in patients with renal disease and azotemia, as well as cardiovascular collapse (hypotensive state of hypoxemia) of any cause.

It is therefore recommended that DBI not be used in the presence of azotemia, and in any clinical situation that predisposes to sustained hypotension that could lead to lactic acidosis.

Appropriate diagnostic measures should be taken in the diabetic patient who has been stabilized on DBI or DBI with insulin, and has subsequently become unstable, so that the type of metabolic acidosis (ketoacidosis versus lactic acidosis, for example) may be properly diagnosed and treated. Such patients should have periodic determinations of ketones in the blood and urine. If electrolyte imbalance is suspected, periodic determinations should also be made of electrolytes, pH and the lactate-pyruvate ratio. DBI should be withdrawn and corrective measures including insulin, when required, should be instituted immediately upon the appearance of any metabolic acidosis.

Hypoglycemia: Hypoglycemic reactions are rare when DBI is used alone. During the dosage adjustment period, however, every precaution should be observed to avoid such reactions, particularly when insulin or a sulfonylurea has been given in combination with DBI.

Other: As with all other hypoglycemic agents, it is recommended that complete physical examinations including hepatic tests, blood counts and ophthalmoscopy be performed on a regular basis.

Phenformin should be used cautiously in patients with Addison's disease and in subjects intolerant to sedatives. The patient should be informed that rapid increase in alcohol intake should be avoided.

Interference with vitamin B₁₂ absorption has been observed recently following the use of biguanide. However, another published study could not confirm this finding.

CONTRAINdications: Acute complications of diabetes mellitus such as acidosis, coma, infection, gangrene, or during or immediately following surgery, where insulin is indispensable; severe hepatic disease, renal disease with uremia, cardiovascular collapse (shock) and after disease states associated with hypoxemia. Phenformin is contraindicated when there are preexisting complications peculiar to diabetes, for example, retinopathy, neuropathy and in latent and prediabetes.

WARNING: Pregnancy — the use of DBI is to be avoided in pregnancy. Phenformin administered to three (3) generations of rats produced no fetal abnormalities. However, until adequate data on the effects of DBI on the human fetus are available, its use in pregnancy can be considered experimental.

As with other hypoglycemic agents it must be ascertained as to whether the diabetes cannot be brought under control with proper diet alone.

The effect of oral hypoglycemic agents on vascular disorders and on other sequelae of diabetes is not completely known. Patients taking these drugs should be closely supervised for both short and long-term complications. Periodic ophthalmoscopic examinations, liver function tests and peripheral blood counts are advisable.

SUPPLIED: TD Capsules 50 mg — Available in bottles of 30, 100 and 500 capsules.

TD Capsules 100 mg — Available in bottles of 100 capsules.

Tablets 25 mg — Available in bottles of 100 and 500 tablets.



ARLINGTON LABORATORIES Division
USV PHARMACEUTICALS OF CANADA LTD. P.O. Box 2220, MONTREAL 379, QUE.

Canadienne des Maladies du Coeur. Or, ces groupes privés dans lesquels travaillent des centaines et des milliers de volontaires ont recueilli des fonds dont l'augmentation annuelle, ces dernières années, a régulièrement dépassé 15%. Pour fin de comparaison, mentionnons que le budget de la Fondation Canadienne des Maladies du Coeur a augmenté de 41.4% de 1969-70 à 1972-73, alors que celui du Conseil de la Recherche Médicale du Canada a augmenté de 21% et que le budget total du gouvernement fédéral a augmenté de plus de 36% durant la même période.

N'est-ce pas la preuve la plus tangible que le public en général est extrêmement favorable à la recherche médicale et qu'il exprime par ses dons la volonté inconditionnelle de l'appuyer. Ce même public donneur est formé de dizaines et de centaines de milliers de citoyens qui manifestent leur intérêt et leur appui pour un domaine qu'ils considèrent prioritaire et certainement pas comme un objet de luxe.

Les économistes posent souvent la question de la rentabilité de la recherche médicale. Avant de tenter d'y répondre, j'aimerais seulement soulever un point théorique qui doit être considéré dans toute discussion budgétaire. Toute société privée ou parapublique qui œuvre dans un champ d'activité économique (ex. sociétés pétrolières, énergie atomique, ordinateur, compagnies pharmaceutiques, etc) calcule dans ses coûts réels les montants qu'elle doit réserver à la recherche afin de demeurer à l'avant-garde dans son domaine particulier et de produire de l'équipement plus perfectionné qui diminuerait les coûts futurs. Pourquoi refuser d'utiliser le même argument pour les soins médicaux? Ceux-ci coûtent au Canada quelques milliards de dollars par année et les frais augmentent plus rapidement que le produit national brut. Or, la recherche biomédicale, par ses découvertes, a déjà apporté et apportera des solutions convenables. Ces découvertes ne sont cependant pas nécessairement "programmées" et sont souvent survenues à la suite d'observations inattendues. On n'avait pas demandé à Fleming de découvrir la pénicilline, mais s'il n'avait pas eu la préparation scientifique suffisante il n'aurait pas pu faire le lien entre l'effet d'une substance (qui fut appelée la pénicilline) sur la croissance de certaines bactéries. À elle seule, cette découverte a fait économiser des milliards de dollars. Que penser de la disparition presque totale de la polyomyélite grâce aux recherches pour des vaccins efficaces développés par Salk et Sabin. Si on calcule qu'un seul cas hospitalisé de paralysie causée par la polyomyélite coûte plus de \$35,000

par année; on se rend compte que la prévention par le vaccin anti-polyomyélitique a ainsi épargné des millions de dollars au gouvernement et a prévenu un grand nombre de souffrances et de tragédies sociales. On pourrait multiplier les exemples et démontrer que les économies occasionnées par seulement quelques grandes découvertes comme celles citées plus haut suffisent maintes fois à payer l'ensemble de toute recherche biomédicale à travers le monde.

Comme je l'ai mentionné un peu plus tôt, ces découvertes ne furent pas programmées ou commandées; elles ont été le résultat de travaux de base qui n'avaient parfois au début aucun lien avec le traitement d'une maladie. Il est aussi difficile de prévoir quelles seront les grandes découvertes de la prochaine décennie. Mais elles auront d'autant plus de chance de survenir que les scientifiques auront pu mettre leur connaissance et leur expertise au service de la science dans des laboratoires bien équipés et pourvus de personnel adéquat.

J'ai bien voulu m'attarder sur l'argument économique parce qu'il est parfois le plus utilisé par les fonctionnaires dans les discussions du budget. Mais il y a un aspect de la recherche biomédicale qu'il ne faut pas oublier: c'est celui, pour les hommes de science, de mettre leurs facultés intellectuelles au service du bien-être de l'humanité. Quand, par exemple, le Conseil des Arts accorde une subvention à un artiste ou à un groupe d'artistes, c'est pour assurer à l'ensemble de la communauté un meilleur développement dans le domaine de l'esprit. Or, je ne crois pas qu'on utilise d'autres critères de sélection que la compétence des artistes et on ne tient certainement pas compte de l'aspect économique. Pourquoi en serait-il autrement de l'homme de science qui, lui aussi, utilise son cerveau et ses connaissances pour assurer à l'ensemble de la communauté à la fois une meilleure connaissance de l'homme mais aussi une meilleure santé sous tous ses aspects (physique, psychique et intellectuel)?

Pour assurer un appui continu à la recherche médicale et éviter les variations budgétaires expérimentées ces dernières années, il serait opportun que nos gouvernements attribuent à la recherche un pourcentage fixe soit du produit national brut, soit des dépenses à la santé. Ainsi les organismes appropriés pourraient établir des programmes à long terme et entrevoir un avenir plus équitable pour les milliers de scientifiques qui mettent leur esprit au service de l'humanité.

J'ai voulu résumer trois séries d'argumentations en faveur de la recherche biomédicale afin d'apporter plus de lumière à nos hommes politiques et nos fonctionnaires. C'est à eux que revient la lourde tâche de favoriser ou de négliger la recherche médicale au pays. J'ai tenté de prouver que la recherche médicale ne doit pas être considérée comme un luxe toléré, statut qu'elle semble avoir actuellement, mais comme une nécessité absolue qui devrait monter de plusieurs échelons dans les priorités gouvernementales.

It is a pity that Mr. Phillipson, in his rambling and rather repetitious report, chose to avoid examination of medical research in relation to education, and finally, care.

Scientific research is a part of the culture and has a role not unlike creative activity in the arts. But it has an additional function, a dividend if you will, in the expansion of knowledge as well as experience. Scientific research is thus a learning experience, of asking questions and seeking answers. Research in the humanities tends to rely on interpretation of the work of others, that is, library research as distinct from the bench research of the natural sciences. My point is that scholarly research is a creative learning experience for the worker and at the same time adds to the general fund of knowledge.

The learning aspect of research is a most important component of university activity, where most of the organized higher learning now takes place. Medical knowledge is no exception. It is growing very rapidly, almost certainly doubling in less than every five years. To keep abreast of this rapid expansion, the learning process in Canadian health centres requires that our imaginative teachers be learners also, at the threshold of their particular fields of endeavour. This form of learning in our medical schools

'Quality teaching, care depend on research'

DR. J. B. ARMSTRONG*

is medical research. The recognition of this learning component by MRC and other health agencies has meant that the distribution of grants and awards has offset, to a degree, regional disparities. It is essential to the continued development of health care in Canada.

The concept stated above has been put somewhat acutely by A. N. Whitehead in "Universities and Their Function":

Do you want your teachers to be imaginative? Then encourage them to do research. Do you want your researchers to be imaginative? Then bring them into intellectual sympathy with the young at the most eager, imaginative period of life, when intellects are just entering upon their mature discipline. Make your researchers explain themselves to active minds, plastic and with the world before them; make your students crown their period of intellectual acquisition by some contact with minds gifted with the experience of intellectual adventure. Education is discipline for the adventure of life; research is intellectual adventure; and the universities should be homes of adventure shared

in common by young and old. For successful education, there must always be a certain freshness in the knowledge dealt with. Knowledge does not keep any better than fish.

Mr. Phillipson referred to the rate of increase of MRC funds, which has been approximately 5% in actual dollars for each of the past four years. This increase has barely kept pace with inflation. At the same time, the total value of applications has increased by more than 12% per annum. This limitation of the rate of increase has another serious consequence, quite aside from the cultural and learning attributes of research. In Canada, practically all medical research is carried out in the universities and their associated hospitals. In most other fields of research, whether physics, chemistry, nuclear, agricultural, fisheries and so forth, large components are undertaken in the Canadian government's own establishments. Perhaps 5% of medical knowledge is developed in Canada. But to maintain the level of competence here, to be able to take advantage of the other 95% of developments that arise outside Canada, it is imperative our leading health centres be provided with the research funds to assure a high level of competence in the main health care fields. To do otherwise will mean that the standards of health care in Canada will deteriorate with each

Dr. Armstrong is chief medical adviser to the Canadian Heart Foundation.